
MIGRANT BUTTERFLIES AND THE MILLENNIUM ATLAS

RICHARD FOX¹, MARTIN WARREN¹, JIM ASHER¹, GAIL JEFFCOATE¹,
STEPHEN JEFFCOATE¹ AND PAUL HARDING²

¹ *Butterfly Conservation, Manor Yard, East Lulworth, Wareham, Dorset BH20 5QP*

² *Biological Records Centre, CEH Monks Wood, Abbots Ripton, Huntingdon PE28 2LS*

Introduction

The Butterflies for the New Millennium (BNM) project was conceived to provide up-to-date information on the distributions of butterflies, and follow up the only previous national survey, which found that many species had undergone substantial declines (Heath *et al.*, 1984). The project, managed in the UK by Butterfly Conservation and the Biological Records Centre (at the Centre for Ecology and Hydrology) and in the Republic of Ireland by The Dublin Naturalists' Field Club, became the largest and most comprehensive butterfly survey ever undertaken in Britain and Ireland.

Through local partnerships between a wide range of conservation and land management organisations, natural history societies and local biological records centres, over 1.6 million records have been collated from some 10,000 recorders. Coverage at the 10 km square level has exceeded 98% in both Britain and Ireland and over 90% of the records have a 1 km square grid reference and a precise date. Most also have information on the number of butterflies seen.

The initial phase of survey work (1995-9) has been analysed and the results published in a major new atlas, the *Millennium Atlas of Butterflies in Britain and Ireland* (Asher *et al.*, 2001). The *Millennium Atlas* presents an up-to-date assessment of the status of our butterflies, the habitats they live in, the threats they face and the major changes that have occurred since publication of the previous atlas (Heath *et al.*, 1984). A wider context is provided by considering long-term trends, derived from over two centuries of recording, and recent changes elsewhere in Europe. In addition, the atlas summarises the wealth of new information about butterfly ecology, incorporates findings from the Butterfly Monitoring Scheme and presents a vision of how these insects might be conserved in the future.

This article reviews information obtained on our main migrant butterflies and how they fared during the five-year BNM survey period, 1995-9. Only non-resident species are discussed and the migration of widespread resident species such as the Large White (*Pieris brassicae*) and Small Tortoiseshell (*Aglais urticae*) is not covered.

Regular migrants

Clouded Yellow *Colias croceus* (Geoff.)

The Clouded Yellow is a regular visitor to Britain and Ireland and, although some are seen every year, the species is renowned for occasional mass

migrations and subsequent widespread breeding. Large numbers of early summer (May/June) immigrants can result in enormous increases in Clouded Yellow abundance and distribution (by August), and are fondly and long remembered as "Clouded Yellow Years". Such events are dramatic, but unpredictable, varying in magnitude even within these islands.

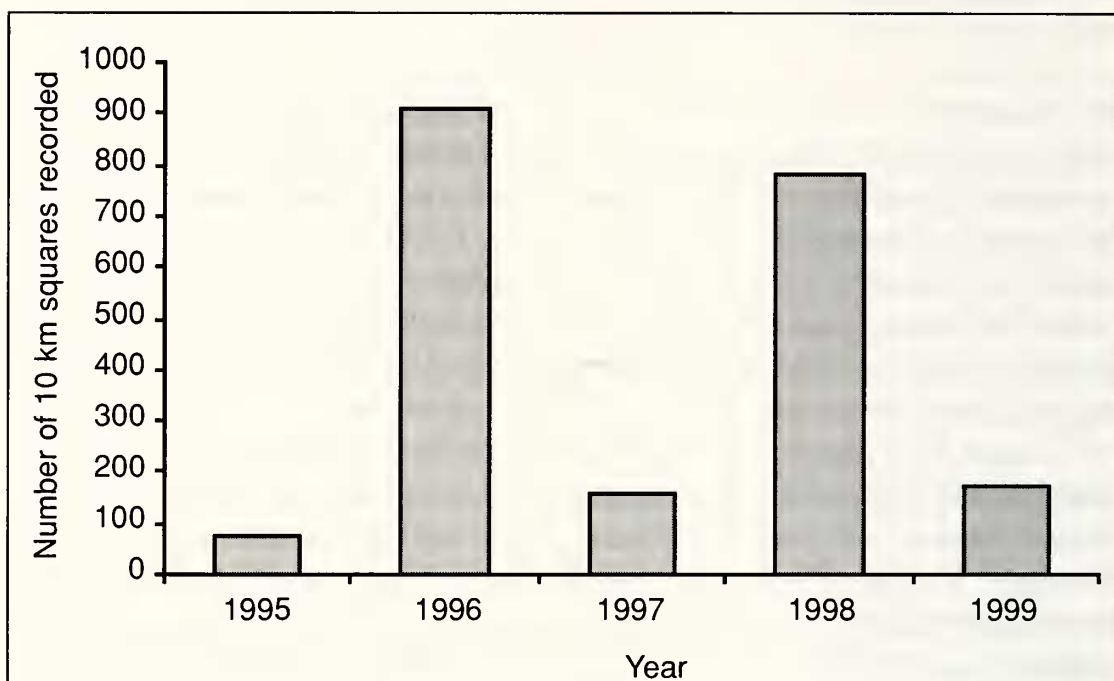


Figure 1: The number of 10 km squares in which the Clouded Yellow was recorded in each year (1995-9).

Within the BNM survey period, 1996 was the most significant year for the Clouded Yellow, with records from 913 10 km squares (see Figures 1 and 2). In that year the butterfly was widespread in southern England, extending northwards and westwards into Northumberland and Cumbria, and as far as Anglesey and Pembrokeshire in Wales. Sightings in Scotland and Ireland were fewer, although this may have been due in part to lower levels of recording. The preceding and subsequent years produced no more than a scattering of records by comparison (76 10 km squares in 1995 and 155 in 1997), suggesting that any successful overwintering of Clouded Yellows had an insignificant effect on the population. In Ireland 1998 proved to be the best year for the species during the survey.

Aside from the major influxes in 1996 and 1998, further interest in the Clouded Yellow was stimulated by convincing observations of overwintering larvae at a coastal site near Bournemouth, Dorset in 1998/9 (Skelton, 1999). Full development of the larvae was recorded and adults were seen at the site from late March 1999, at which time conditions appeared to be unfavourable for migration from continental Europe. Previously, many authors had doubted the potential of this species to survive winters in Britain or Ireland, but these observations suggest strongly that overwintering is possible.

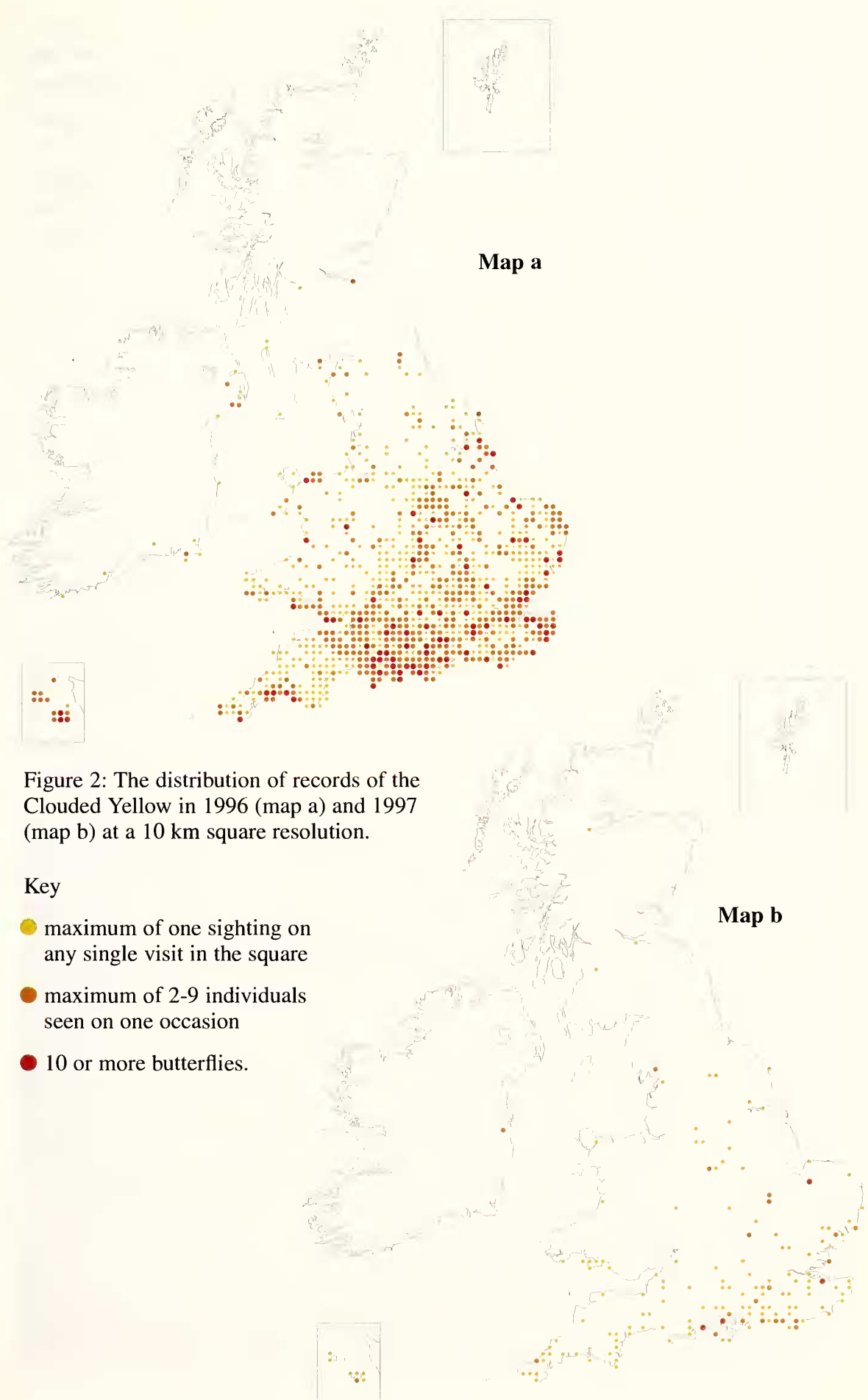


Figure 2: The distribution of records of the Clouded Yellow in 1996 (map a) and 1997 (map b) at a 10 km square resolution.

Red Admiral *Vanessa atalanta* (L.)

In contrast, there is considerable evidence for the overwintering of the Red Admiral. Although it is still classed as a migrant rather than a resident species, this distinction appears to be blurring as recent field work has shown eggs and larvae, as well as adults, to be present (sometimes in high numbers) during the winter in southern England (Tucker, 1996). The survival of these overwintering individuals, coupled with the variable waves of migration from continental Europe and summer breeding, make the interpretation of records difficult.

As a highly mobile species that may be encountered in any habitat, from seashore to city centres and mountain tops, the Red Admiral has an almost ubiquitous distribution in Britain and Ireland that has changed little over the past few decades. However, the abundance of the butterfly as measured by the Butterfly Monitoring Scheme (BMS) run by the Centre for Ecology and Hydrology (Pollard & Yates, 1993), shows a different picture. As with other migrant species, abundance varies greatly from year to year. For example, in the BNM survey period there were high numbers of Red Admirals in 1995 and 1996, followed by much lower abundance in 1997-9. With migration being such a variable phenomenon, the abundance of migratory species in Britain is not expected to be correlated from one year to the next, and this is the case for the Painted Lady (*Vanessa cardui*). However, during the past 20 years the abundance of the Red Admiral at BMS sites has increased significantly (Figure 3). Since abundance in spring is not correlated with that of the previous autumn, this trend does not appear to be caused by increasing numbers of overwintering individuals (Pollard & Greatorex-Davies, 1998).

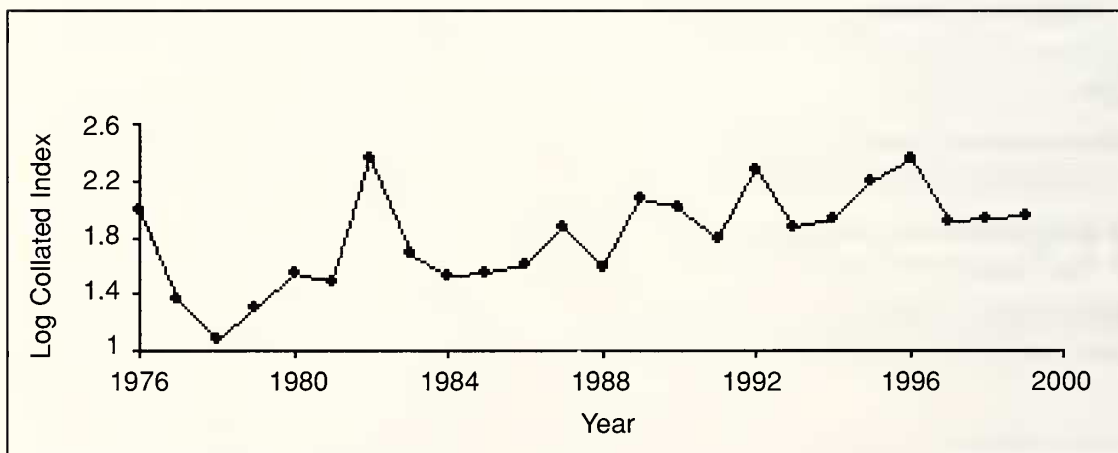


Figure 3: Red Admiral numbers have increased significantly at sites in the Butterfly Monitoring Scheme since 1976.

The BMS data for the Red Admiral reveal two other interesting and statistically significant trends. Analysis has shown that the first record of the species each year at monitored sites was on average 36 days earlier in the mid-1990s compared to the mid-1970s (Roy & Sparks, 2000). Similarly the flight

period of the butterfly has lengthened significantly (by an average of nearly 40 days) during the same period. The relative roles of overwintering and migration in these trends have not been assessed, but climatic warming is strongly implicated as the driving factor.

Painted Lady *Vanessa cardui* (L.)

The Painted Lady completes the trio of regular migrant species. In terms of distribution, it occupies the middle ground, being more widely distributed in most years than the Clouded Yellow, but less widespread than the Red Admiral. The Painted Lady makes long distance migrations from North Africa to recolonise Britain and Ireland each year, reaching even the most remote of our islands (it was the only butterfly recorded on St Kilda during the BNM survey). The distribution and abundance of the species varies greatly from year to year and the best year during the BNM survey was 1996. In that year the butterfly was recorded from 2110 10 km squares, which compares to an average of around 1000 in each of the other four years of the project. Not surprisingly, the abundance of the Painted Lady measured by the BMS was exceptionally high in 1996, but fell to average levels in subsequent years. There is no significant relationship between the numbers recorded in successive years throughout the 25 years of the BMS, indicating that the summer breeding that occurs here every year makes little contribution to long-term populations and that overwintering survival is low. A pan-European study of the 1996 migration event concluded that the level of migration from the permanent populations in North Africa was the most important factor determining abundance in European countries (Pollard *et al.*, 1998).



Painted Lady *Vanessa cardui* (L.) Photograph: © Martin Warren, Butterfly Conservation

As with the Clouded Yellow, most authors have concluded that the Painted Lady has little or no ability to overwinter in Britain and Ireland (Emmet & Heath, 1989; Thomas & Lewington, 1991). However, in the winter of 1997/8 a marked adult overwintered successfully at Hayle, Cornwall (Wacher, 1998).

Figure 4: The distribution of Camberwell Beauty records (1995-9) at 10 km square resolution.

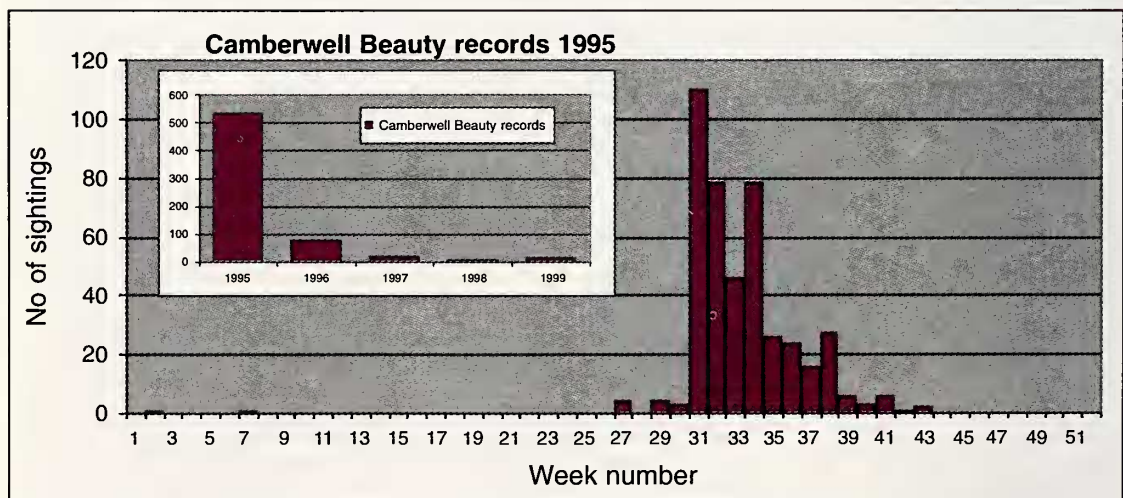
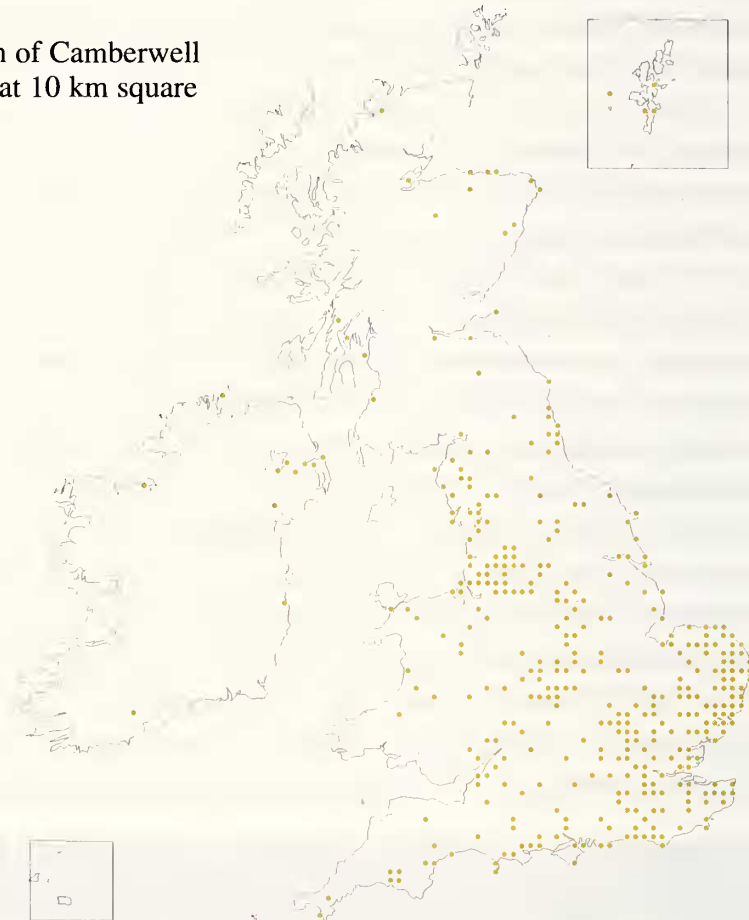


Figure 5: The number of Camberwell Beauty records by week during 1995, showing the timing of the major influx of migrants. The inset graph shows the total number of records of the Camberwell Beauty received in each year (1995-9).

It is not known whether the butterfly was capable of breeding after surviving the winter, but it does suggest that overwintering might be a more common event than was previously realised.

Rarer migrants

Camberwell Beauty *Aglais antiopa* (L.)

The Camberwell Beauty is a large, mobile and unmistakable butterfly that is rarely seen in Britain and Ireland, but which occasionally arrives in large numbers. Most of the individuals seen here probably migrate from Scandinavia, where the species is widespread. It has been suggested that the temperate winter conditions of Britain and Ireland are too mild and damp for successful hibernation of Camberwell Beauties in most years (Thomas & Lewington, 1991), although there is some evidence of occasional overwintering (e.g. early spring sightings in 1996). In contrast to the regular migrant species discussed above, there are no breeding records for the Camberwell Beauty here.

The distribution of Camberwell Beauty records from the BNM survey reflects the Scandinavian origin of the immigrants, with many sightings in East Anglia and south-east England (see Figure 4). Nevertheless, the species was recorded right across Britain and in both Northern Ireland and the Republic of Ireland. As with other migrant species, large influxes of Camberwell Beauties have occurred in particular years (e.g. 1846, 1872, 1947 and 1976), and an unusually large number arrived in 1995 during a period of persistent easterly winds (Tunmore, 1996). Assessment of the dates of BNM records during this influx suggested the sudden arrival of many individuals (see Figure 5) and also showed the near simultaneous immigration of butterflies at all latitudes in Britain, which is consistent with migration from the east, but not from the south.

Queen of Spain Fritillary *Issoria lathonia* (L.)

This species is a rare visitor to England and the Channel Islands, and very few records exist for Ireland, Scotland and Wales. The butterfly was more common in the latter half of the nineteenth century and in the 1940s, and there are rare records of breeding, although no historical evidence of successful overwintering. Sightings of the Queen of Spain Fritillary were very rare between 1950 and 1989, but the BNM survey period saw a dramatic increase in records.

Many of the recent sightings were in East Anglia, where the species was very rare during most of the twentieth century. Of particular note were a series of sightings on and around the Royal Society for the Protection of Birds' Minsmere Reserve on the Suffolk coast. These records, which began in 1995 and rose to a peak in 1997, suggested that immigrant Queen of Spain Fritillaries were breeding in the area, giving rise to "native" late-summer broods. Furthermore, the overall number of sightings and one record of an adult early in the season led to the exciting possibility that overwintering had occurred and a resident colony had been founded (Wilson, 1998). These hopes

were short-lived and there were very few sightings in the area in subsequent years.

The outlook for this species appears brighter than for many decades. Its distribution and abundance are increasing in the Netherlands, Belgium and France and we might expect the recent increase in the numbers of migrants reaching Britain to continue.

Monarch *Danaus plexippus* (L.)

There was a similar increase in Monarch sightings in Britain and Ireland during the BNM survey. It is now widely accepted that most Monarchs seen here are true migrants from North America, carried across the Atlantic by strong weather systems (Coombes & Tucker, 1996; Davey, 2000), although a few may be released or escape from captive stock or migrate from the small European populations. The distribution of sightings shows a strong south-westerly and coastal bias, which is consistent with trans-Atlantic migration.



Monarch *Danaus plexippus* (L.)

Photograph: © Butterfly Conservation

As with other migrant butterflies, high numbers of Monarchs have arrived here in particular years (e.g. 1968 and 1981). The two largest influxes ever recorded in Britain and Ireland both occurred during the BNM survey, in the autumns of 1995 and 1999. It is very difficult to determine the numbers of individuals involved, but there were approximately 200 sightings in 1995 and over 400 in 1999. An analysis of the dates of records in 1999 suggests the almost simultaneous arrival of many individuals in late September and a delay between the first sightings in south-west England and south-west Ireland and sightings elsewhere, a pattern consistent with the influx arriving from the south-west.

Despite the recent increase in the numbers of migrant Monarchs reaching our shores, the species remains little more than a delightful curiosity. Its larval foodplants (Milkweeds *Asclepias* spp.) are not native to Britain and Ireland and are not widely cultivated, so there are no realistic prospects of breeding or colonisation.

Other rare migrant species

Records of several other rare migrant species were received during the BNM survey. Interpretation of some of these is limited by identification difficulties (e.g. the Pale Clouded Yellow, *Colias hyale* and Berger's Clouded Yellow *C. alfacariensis*) or simply by the extreme rarity of records (e.g. the Bath White, *Pontia daplidice* and Short-tailed Blue, *Cupido argiades*). Even the Long-tailed Blue *Lampides boeticus*, which is readily identified and was recorded in each year of the BNM survey, presents problems in determining the origin of individuals. Migration is a regular feature of Long-tailed Blue populations in continental Europe, and it seems likely that some, perhaps most, of the individuals recorded in Britain are genuine immigrants. However, these may be confused with deliberately released individuals or adults that have emerged from imported foodstuffs. There have been several records of the latter in recent years (and presumably many unrecorded ones), which is perhaps not surprising as several culinary bean and pea species are amongst its range of over 45 larval foodplants worldwide.

Recent records of the Large Tortoiseshell *Aglais polychloros* are also difficult to interpret. This large, mobile butterfly is thought to have become extinct in Britain during the 1980s. Nevertheless, there were records from 29 10 km squares during the BNM survey in southern and eastern England and in the Channel Islands. These records have been carefully checked to exclude misidentifications of Small Tortoiseshells, but it is not possible to separate genuine migrants from continental Europe from captive bred individuals that have escaped or been released. Many of the recent records are from coastal areas and are probably of genuine migrants, but our knowledge of this species is hampered by the continued release of captive stock by breeders.

Discussion

It is apparent from this brief review that the BNM survey period (1995-9) was an exciting time for those interested in migrant butterflies. All of the regular migrants had at least one particularly good year: the Clouded Yellow in 1996 and 1998, the Red Admiral in 1995 and 1996 and the Painted Lady in 1996. Naturalists have also gathered important direct and indirect evidence for their overwintering abilities. In addition, sightings of some of our rarer migrants, such as the Queen of Spain Fritillary and Monarch appear to have substantially increased in frequency in comparison to previous decades. Do these findings represent a widespread change or are they mere coincidence? Whilst the collation of records for the BNM project has identified these

events, it has shed little light on their causes and, indeed, whether the recent increases indicate a real trend or just natural variation. If there is a real trend towards increased numbers or frequency of all these migrant butterflies, it is unlikely to be related to habitat change either here or in their permanent ranges, since human management of the landscape during the past few decades has been detrimental to most butterfly species. It is interesting to speculate whether climate change will allow any of these species to become permanent residents, but only time, and continued recording will tell.

Acknowledgements and further information

The BNM project and the *Millennium Atlas* would not have been possible without the enthusiastic participation and support of many organisations and individual recorders. Generous sponsorship was provided by the Vincent Wildlife Trust, the Esmée Fairbairn Charitable Trust, ICI, The Heritage Council and the Joint Nature Conservation Committee.

References

- Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S., 2001. *The Millennium Atlas of Butterflies in Britain and Ireland*. Oxford University Press, Oxford.
- Coombes, S. & Tucker, V., 1996. The Monarch invasion of Great Britain 1995. *Butterfly Conservation News* **63**: 30–35.
- Davey, P., 2000. Backtrack for the 1999 Monarch *Danaus plexippus* (Linn.) influx. *Atropos* **9**: 17–18.
- Emmet, A.M. & Heath, J., (Eds) 1989. *The moths and butterflies of Great Britain and Ireland, 7, Part 1, HesperIIDae-Nymphalidae, The butterflies*. Harley Books, Colchester.
- Heath, J., Pollard, E., & Thomas, J.A., 1984. *Atlas of butterflies in Britain and Ireland*. Viking, Harmondsworth.
- Pollard, E. & Greatorex-Davies, J.N., 1998. Increased abundance of the Red Admiral *Vanessa atalanta* in Britain: the roles of immigration, overwintering and breeding within the country. *Ecology Letters* **1**: 77-81.
- Pollard, E. & Yates, T.J., 1993. *Monitoring butterflies for ecology and conservation*. Chapman and Hall, London.
- Pollard, E., Swaay, C.A.M. van, Stefanescu, C., Lundsten, K.E., Maes, D., & Greatorex-Davies, J.N., 1998. Migration of the painted lady butterfly *Cynthia cardui* in Europe: evidence from monitoring. *Diversity and Distributions* **4**: 243-253.
- Roy, D.B. & Sparks, T.H., 2000. Phenology of British butterflies and climate change. *Global Change Biology* **6**: 407-416.
- Skelton, M., 1999. Successful overwintering by Clouded Yellow *Colias croceus* in southern England. *Atropos* **8**: 3-6.
- Thomas, J.A. & Lewington, R., 1991. *The butterflies of Britain and Ireland*. Dorling Kindersley, London.
- Tucker, J.M., 1996. The Red Admiral – overwintering in the UK in its early stages. *Butterfly Conservation News* **62**: 21-22.
- Tunmore, M., 1996. The 1995 Camberwell Beauty *Nymphalis antiopa* (L.) influx. *Atropos* **1**: 2-5.
- Wacher, J., 1998. Successful overwintering of Painted Lady *Cynthia cardui* in the UK. *Atropos* **5**: 19-20.
- Wilson, R., 1998. The Queen of Spain Fritillary *Argynnis lathonia* – a new British breeding species? *Atropos* **5**: 3-7.